



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application: : Group Art Unit: 2827
B. Centola et al : Examiner: J. C. Norris
5 Serial No.: 10/016,426 : IBM Corporation
Filed: 10/016,426 : Intellectual Property Law
Title: ELECTROMAGNETIC SHIELD FOR : Department N50/040-4
PRINTED CIRCUIT BOARDS : 1701 North Street
: Endicott, NY 13760

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Assistant Commissioner For Patents
Washington, DC 20231

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Sir:

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AMENDMENT

In response to the Office Action dated 08/14/02, please amend the above-identified application as follows:

1. A printed circuit board (PCB) assembly comprising:

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a multi-layer printed circuit board substrate having a side edge, first and second opposite surfaces, and signal and ground conductors;

a conductive channel enclosing said side edge, said channel being electrically connected to said ground conductor to provide electromagnetic shielding of said side edge; and

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a plate within said channel substantially parallel to said first surface, and means for moving said plate toward said first surface such that said plate and an opposite surface of said channel engage said printed circuit board about said side edge, said plate being electrically connected to said ground conductor.

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2. The PCB of claim 1 wherein a cross-section of said channel in a plane perpendicular to said first and second surfaces and said side edge is substantially U-shaped.
3. The PCB of claim 1 wherein said moving means comprise an adjustment screw which engages said plate.
- 5 4. The PCB of claim 3 wherein said adjustment screw is mounted in a threaded bore in said channel perpendicular to said plate.
5. The PCB of claim 3 wherein said adjustment screw is mounted in a threaded bore in said channel parallel to said plate.
6. The PCB of claim 1 wherein said channel includes pins perpendicular to said first surface to mount in conductive holes in said printed circuit board to electrically connect said channel to said ground conductor.
- 10 7. A printed circuit board (PCB) comprising:
 - a substrate having a first edge portion and including a ground layer therein;
 - a substantially U-shaped device secured to said PCB to provide a cover for said first edge portion; and

15 connection means for electrically coupling said substantially U-shaped device to said ground layer within said substrate, said substantially U-shaped device substantially preventing electromagnetic radiation from being emitted from said first edge portion; and wherein said substantially U-shaped device is of unitary construction; and further comprising

20 at least one conductive plate movably positioned within said substantially U-shaped device to be electrically coupled to said ground layer within said PCB.

8. The PCB of claim 7 further including means for engaging said at least one conductive plate to cause said plate to move within said substantially U-shaped device.

9. The PCB of claim 8 wherein said means for engaging said at least one conductive plate comprises a screw.

5 10. The PCB of claim 8 wherein said conductive plate further includes a wedge-shaped member which movably engages said substantially U-shaped device during said movement within said device.

11. A printed circuit board (PCB) comprising:

a substrate having a first edge portion and including a ground layer therein;

10 a substantially U-shaped device secured to said PCB to provide a cover for said first edge portion; and

15 connection means for electrically coupling said substantially U-shaped device to said ground layer within said substrate, said substantially U-shaped device substantially preventing electromagnetic radiation from being emitted from said first edge portion; and wherein said PCB further includes electrically conductive vias or plated through holes (PTHs) as part thereof and coupled to said ground layer, said connection means including a plurality of projecting pins adapted for electrically contacting said conductive vias or said PTHs when said substantially U-shaped device is secured to said PCB.

12. The PCB of claim 11 wherein said projecting pins are press-fit or compliant pins.

20 13. The PCB of claim 1 wherein said PCB is adapted for being positioned within a rack or chassis, said PCB including means for electrically coupling said substantially

U-shaped device to said rack or chassis.

14. The PCB of claim 13 wherein said means for electrically coupling said substantially U-shaped device to said rack or chassis comprises a projecting ledge, said projecting ledge adapted for slidably engaging said rack or chassis.
- 5 15. The PCB of claim 14 wherein said projecting ledge is electrically coupled to said connection means.
16. The PCB of claim 1 wherein said substantially U-shaped device is secured to said PCB by adhesive.

Please enter new claims 17-18 as follows:

- 10 17. A printed circuit board assembly comprising:
 - a multi-layer printed circuit board substrate having a side edge, first and second opposite surfaces, and signal and ground conductors;
 - a conductive channel enclosing said side edge, said channel being electrically connected to said ground conductor to provide electromagnetic shielding of said side edge, said conductive channel comprising first and second plates substantially parallel to said first and second opposite surfaces, a third plate connected to said first plate perpendicular thereto, and a fourth plate connected to said second plate perpendicular thereto, said third plate comprising a tongue portion extending into a recess in said fourth plate, said third and fourth plates being peripheral of said side edge; and
 - 15 20 a threaded fastener within said third and fourth plates perpendicular to said first and second plates to control how far said tongue extends into said recess and thereby a

spacing between said first and second plates such that said first and second plates engage said opposite surfaces of said printed circuit board.

18. A printed circuit board as set forth in claim 17 wherein at least one of said first and second plates includes pins projecting inwardly of said channel and secured in holes in said printed circuit board to ground said channel.

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REMARKS

Claims 7-12 were found allowable if rewritten in independent form including all the limitations of the base claim 1 and any intervening claims. This has been done above, so amended claims 7-12 should be allowable.

5 Original claim 1 has been amended above, and distinguishes over the cited art for similar reasons as claim 7. Claims 2 -6, 13-16 depend on claim 1.

New claim 17 recites that the conductive channel encloses the side edge. The conductive channel comprises first and second plates generally parallel to the first and second opposite surfaces of the printed circuit board. The channel also comprises a third plate connected to the 10 first plate perpendicular thereto, and a fourth plate connected to the second plate perpendicular thereto. The third plate comprises a tongue portion extending into a recess in the fourth plate. The third and fourth plates being peripheral of the side edge. A threaded fastener is located within the third and fourth plates perpendicular to the first and second plates to control how far said tongue extends into the recess and thereby a spacing between the first and second plates such 15 that the first and second plates engage the opposite surfaces of the printed circuit board.

None of the cited references discloses a threaded fastener within such third and fourth plates to control the spacing between the first and second plates. Siwinski discloses two metal plates 40 and 50 which shield upper and lower surfaces of a printed circuit board 20. The metal plates are electrically connected to metal pads 30 on the printed circuit board via a metallic clip 20. Spacing between plates 40 and 50 is not controlled by a threaded fastener. Bhargava et al disclose an equipment enclosure having a top portion 27 and a bottom portion 40. There is a mounting post or standoff 26 between top portion 27 and printed circuit board 55, and a standoff 15 between bottom portion 40 and printed circuit board 55. Spacing between top portion 27 and bottom portion 40 is not controlled by a threaded fastener within third and fourth plates 25 peripheral of the side edge of the printed circuit board. Instead, Bharbava et al. use a screw 52 within the enclosure, which screw passes through the printed circuit board wasting surface area.

Miller et al. disclose a printed circuit board 10 with shield structures 40. In contrast to claim 17, each shield structure of Miller et al. has a fixed opening size to accomodate a printed circuit board having a predetermined thickness. There is no threaded fastener to adjust the spacing between parallel plates of the shield structure 40, and thereby accomodate printed circuit boards of differing thicknesses. Figure 7 of Miller et al. illustrates a resilient, snap on shield structure 62, but this also lacks the threaded fastener to adjust the spacing between parallel plates of a channel.

Thus, none of the cited art discloses or even suggests the novel technique of claim 17 to adjust the spacing between the parallel plates of a channel shield. New claim 18 depends on claim 17. Therefore, the present patent application, as amended above, should be allowed.

Respectfully submitted,



Arthur J. Samodovitz
Reg. No: 31,297